Claims

1. A method of power production comprising alternately coupling a compression ignition engine to an AC electrical generator or to a DC homopolar generator, wherein the homopolar generator produces an electric current which is used to electrolyse water into hydrogen and oxygen.

2. A method as claimed in claim 1, wherein an oxygen enriched combustion atmosphere is provided in the engine, said atmosphere being prepared by mixing pure oxygen, which is produced by the water electrolysis process, with normal atmospheric air.

3. A method as claimed in claim 1 or 2, wherein the oxygen enriched atmosphere contains between 2% and 6% extra oxygen, i.e. the air has a composition of between 23% oxygen, 77% nitrogen and 27% oxygen and 73% nitrogen.

4. A method as claimed in claim 1 or 2, wherein the wherein the oxygen enriched atmosphere contains more than 6% extra oxygen.

5. A method as claimed in any preceding claim, wherein the fuel for the engine is a fossil petroleum fuel oil, such as diesel gas oil, medium fuel oil or heavy fuel oil, or the fuel is a fossil waste based oil, such as recovered fuel oil or waste mineral oil.

6. A method as claimed in any of claims 1 to 4, wherein the fuel for the engine is a non-fossil biofuel such as vegetable oil, animal fat, fish oil, natural alcohol or mixtures of such biofuels, or the fuel is a non-fossil waste based material, such as waste vegetable oil, waste animal fat, waste fish oil, waste alcohol or waste cooking oil.

7. A method as claimed in any preceding claim, wherein the engine is coupled to the AC generator and the DC homopolar generator in such a manner as to be coupled to only one generator at a time.

8. A method as claimed in claim 7, wherein the compression ignition engine is run on a non-fossil biofuel when the engine is used to drive the AC generator.

9. A method as claimed in any preceding claim, wherein the engine is run at a fixed, controlled speed that provides efficient engine performance and optimum power generation.

10. A method as claimed in any preceding claim, wherein the homopolar generator comprises an electromagnetic coil to produce an annular toroidal magnetic field; means to position a conductive metal disc in the toroidal magnetic field so that the disc is intersected by both the forward and the return magnetic fields of the toroidal magnetic field; means to connect the conductive disc to a drive shaft that is rotated by the compression ignition engine; and means to collect electric current generated in the conductive disc when the disc is rotated through the toroidal magnetic field.

11. A method as claimed in claim 10, wherein the DC electricity from the homopolar generator has a voltage of between about 1 and 2 volts and a current of about 5000 amps/m^2 or more.

12. A method as claimed in any preceding claim, wherein the compression ignition engine drives a multiplicity of homopolar generators that are connected together either in series and/or in parallel.

13. A method as claimed in any preceding claim, wherein a single homopolar generator or a multiple combination of homopolar generators is/are connected by an electrical circuit to either a single water electrolysis unit or to a multiple combination of water electrolysis units that are also connected together either in series and/or in parallel.

14. A method as claimed in claim 13, wherein the or a water electrolysis unit is a low pressure, low temperature electrolysis system that operates at about 70°C and under normal ambient atmospheric pressure conditions, and where said water electrolysis unit consists of a large plurality of electrolysis cells each containing an electrolyte comprising a 25% solution of potassium hydroxide.

15. A method as claimed in any preceding claim, wherein the homopolar generator powers a water electrolysis unit and the hydrogen from the water electrolysis process is used as a

renewable fuel, either in the form of a gaseous fuel or as a reactant in a fuel cell, and the oxygen from the water electrolysis unit is used to produce the oxygen enriched combustion atmosphere for the engine, and the oxygen is also, optionally, used as a reactant, along with the hydrogen, in a fuel cell.

16. A method as claimed in any preceding claim, wherein the heat from the combustion process is recovered for local use.

17. A method as claimed in claim 16 wherein heat in the engine exhaust is recovered by using the heat to produce steam in a boiler and using the steam for either local heating purposes or to drive a steam turbine.

18. A method as claimed in claim 16, wherein the heat from the engine cooling system is recovered and used for local heating purposes.

19. A method as claimed in any preceding claim, wherein exhaust gas from the engine is treated, dependent on an analysis of the exhaust gas, so that prescribed pollutants in the exhaust gas are reduced to an acceptable environmental level before the exhaust gas is released into the atmosphere.

20. An energy generating system comprising a compression ignition engine; means to supply an oxygen enriched combustion atmosphere to the combustion chamber(s) of the engine; means to supply liquid fuel of either fossil or non-fossil origin to the combustion chamber(s) of the engine; an AC electrical generator; a DC homopolar electrical generator; means for alternately coupling the engine to the AC generator or the DC generator; a water electrolysis unit; and means to supply the current from the DC homopolar generator to the water electrolysis unit.

21. A system as claimed in claim 20 further comprising means to use the oxygen produced by the water electrolysis unit to prepare the oxygen enriched combustion atmosphere for the engine.

22. A system as claimed in any of claims 20 or 21, wherein the homopolar generator comprises an electromagnetic coil to produce an annular toroidal magnetic field; means to position a conductive metal disc in the toroidal magnetic field so that the disc is intersected by both the forward and the return magnetic fields of the toroidal magnetic field; means to connect the conductive disc to a drive shaft that is rotated by the compression ignition engine; and means to collect electric current generated in the conductive disc when the disc is rotated through the toroidal magnetic field.

23. A system as claimed in any of claims 20 to 22 wherein the DC electricity from the homopolar generator has a voltage of between about 1 and 2 volts and a current of about 5000 amps/m^2 or more.

24. A system as claimed in any of claims 20 to 23, wherein the compression ignition engine drives a multiplicity of homopolar generators that are connected together either in series and/or in parallel.

25. A system as claimed in any of claims 20 to 24, wherein a single homopolar generator or a multiple combination of homopolar generators is/are connected by an electrical circuit to either a single water electrolysis unit or to a multiple combination of water electrolysis units that are also connected together either in series and/or in parallel.

26. A system as claimed in any of claims 20 to 25, wherein the or a water electrolysis unit is a low pressure, low temperature electrolysis system that operates at about 70°C and under normal ambient atmospheric pressure conditions, and where said water electrolysis unit consists of a large plurality of electrolysis cells each containing an electrolyte comprising a 25% solution of potassium hydroxide.

27. A method of using a compression ignition engine in a renewable energy system, wherein a diesel engine burns either fossil or non-fossil liquid fuels and at least part of the electricity generated by the diesel engine is then used to produce an alternative form of renewable non-fossil fuel.

28. A method of using a compression ignition engine in an integrated renewable energy system, whereby the engine is used to drive either an AC electrical generator to produce electricity or a DC electrical generator to supply the electric current needed to electrolyse water into hydrogen and oxygen.

29. A method of power production comprising coupling a compression ignition engine to an AC electrical generator and/or to a DC homopolar generator, wherein the homopolar generator produces an electric current which is used to electrolyse water into hydrogen and oxygen.